CBCS Scheme

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15MAT41

Fourth Semester B.E. Degree Examination, June/July 2018
Engineering Mathematics – IV

Time: 3 hrs. Max. Marks: 80

Note: **1.** ***Answer any FIVE full questions, choosing one full question from each module.***
2. ***Use of statistical tables is permitted.***

Module-1

1 a. Use Taylor's series method to find y at x = 1.1, considering terms upto third degree given that $\frac{dy}{dx} = x + y$ and $y(1) = 0$. **(05 Marks)**

b. Using Runge-Kutta method, find y(0.2) for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$; $y(0) = 1$, taking h = 0.2. **(05 Marks)**

c. Given $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$ and the values $y(0.1) = 0.90516$, $y(0.2) = 0.82127$, $y(0.3) = 0.74918$, evaluate y(0.4), using Adams-Bashforth method. **(06 Marks)**

OR

2 a. Using Euler's modified method, find y(0.1) given $\frac{dy}{dx} = x - y^2$, $y(0) = 1$, taking h = 0.1. **(05 Marks)**

b. Solve $\frac{dy}{dx} = xy$; $y(1) = 2$, find the approximate solution at x = 1.2, using Runge-Kutta method. **(05 Marks)**

c. Solve $\frac{dy}{dx} = x - y^2$ with the following data $y(0) = 0$, $y(0.2) = 0.02$, $y(0.4) = 0.0795$, $y(0.6) = 0.1762$, compute y at x = 0.8, using Milne's method. **(06 Marks)**

Module-2

3 a. Using Runge-Kutta method of order four, solve $y'' = y + xy'$, $y(0) = 1$, $y'(0) = 0$ to find y(0.2). **(05 Marks)**

b. Express the polynomial $2x^3 - x^2 - 3x + 2$ in terms of Legendre polynomials. **(05 Marks)**

c. If α and β are two distinct roots of $J_n(x) = 0$ then prove that $\int_0^1 x\, J_n(\alpha x) J_n(\beta x)\, dx = 0$, if $\alpha \neq \beta$. **(06 Marks)**

OR

4 a. Given $y'' = 1 + y'$; $y(0) = 1$, $y'(0) = 1$, compute y(0.4) for the following data, using Milne's predictor-corrector method.

$y(0.1) = 1.1103$ $y(0.2) = 1.2427$ $y(0.3) = 1.399$
$y'(0.1) = 1.2103$ $y'(0.2) = 1.4427$ $y'(0.3) = 1.699$. **(05 Marks)**

b. Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. **(05 Marks)**

c. Derive Rodrigue's formula $P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n}\left[(x^2 - 1)^n\right]$. **(06 Marks)**

Module-3

5 a. Derive Cauchy-Riemann equations in polar form. **(05 Marks)**

b. Evaluate $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$ where C is the circle $|z| = 3$, using Cauchy's residue theorem. **(05 Marks)**

c. Find the bilinear transformation which maps $z = \infty$, i, 0 on to $w = 0$, i, ∞. **(06 Marks)**

OR

6 a. State and prove Cauchy's integral formula. **(05 Marks)**

b. If $u = \frac{\sin 2x}{\cosh 2y + \cos 2x}$, find the corresponding analytic function $f(z) = u + iv$. **(05 Marks)**

c. Discuss the transformation $w = z^2$. **(06 Marks)**

Module-4

7 a. Derive mean and standard deviation of the binomial distribution. **(05 Marks)**

b. If the probability that an individual will suffer a bad reaction from an injection of a given serum is 0.001, determine the probability that out of 2000 individual (i) exactly 3 (ii) more than 2 individuals will suffer a bad reaction. **(05 Marks)**

c. The joint probability distribution for two random variables X and Y is as follows:

X \ Y	-3	-2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

Determine: i) Marginal distribution of X and Y ii) Covariance of X and Y
iii) Correlation of X and Y **(06 Marks)**

OR

8 a. Derive mean and standard deviation of exponential distribution. **(05 Marks)**

b. In an examination 7% of students score less than 35% marks and 89% of students score less than 60% marks. Find the mean and standard deviation if the marks are normally distributed. Given $P(0 < z < 1.2263) = 0.39$ and $P(0 < z < 1.14757) = 0.43$. **(05 Marks)**

c. The joint probability distribution of two random variables X and Y is as follows:

Y \ X	-4	2	7
1	1/8	1/4	1/8
5	1/4	1/8	1/8

Compute: i) E(X) and E(Y) ii) E(XY) iii) COV(X, Y) iv) $\rho(X, Y)$ **(06 Marks)**

Module-5

9 a. Explain the terms: i) Null hypothesis ii) Type I and Type II errors. **(05 Marks)**

b. The nine items of a sample have the values 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significantly from the assumed mean of 47.5? **(05 Marks)**

c. Given the matrix $A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ ½ & ½ & 0 \end{pmatrix}$ then show that A is a regular stochastic matrix. **(06 Marks)**

OR

10 a. A die was thrown 9000 times and of these 3220 yielded a 3 or 4, can the die be regarded as unbiased? **(05 Marks)**

b. Explain: i) Transient state ii) Absorbing state iii) Recurrent state **(05 Marks)**

c. A student's study habits are as follows. If he studies one night, he is 70% sure not to study the next night. On the other hand, if he does not study one night, he is 60% sure not to study the next night. In the long run, how often does he study? **(06 Marks)**

CBCS Scheme

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15CV42

Fourth Semester B.E. Degree Examination, June/July 2018
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Assume any missing data, if any.

Module-1

1 a. Determine the degree of static indeterminacy for the following structures [Fig.Q.1(a)]. **(08 Marks)**

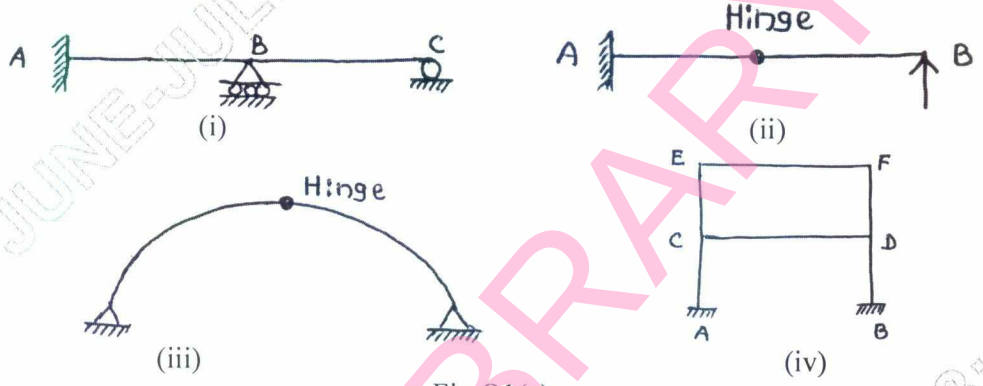

Fig.Q1(a)

b. Determine the forces in all the members of a truss shown in the Fig.Q.1(b) by method of joints and tabulate the results. **(08 Marks)**

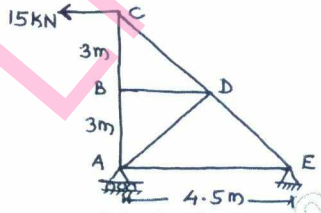

Fig.Q1(b)

OR

2 a. Differentiate between statically determinate and indeterminate structures. **(06 Marks)**

b. State the assumptions made in the analysis of truss. **(02 Marks)**

c. A truss of span 9m is loaded as shown in Fig.Q.2(c). Find the forces in the members marked 1, 2 and 3. **(08 Marks)**

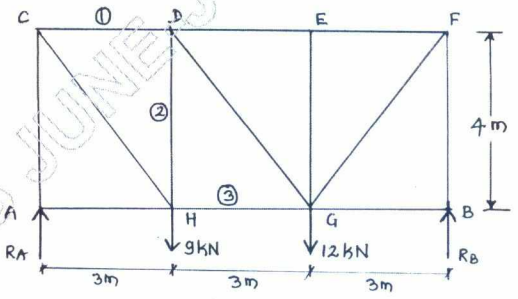

Fig.Q.2(c)

Module-2

3 a. Determine the slope at supports and maximum deflection of a simply supported beam subjected to UDL throughout the span 'L'. Use Double Integration Method. **(08 Marks)**

b. A cantilever of length 2m carries a point load of 20kN at the free end and another load of 20kN at its centre. If $E = 10^5 N/mm^2$ and $I = 10^8 mm^4$ for the cantilever, then determine by moment-area method, the slope and deflection at the free end. Refer Fig.Q.3(b). **(08 Marks)**

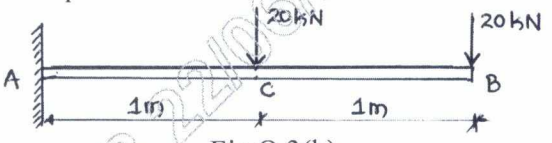

Fig.Q.3(b)

OR

4 a. Compute the deflection under concentrated load for the beam shown in Fig.Q.4(a) by using Macaulay's method. **(08 Marks)**

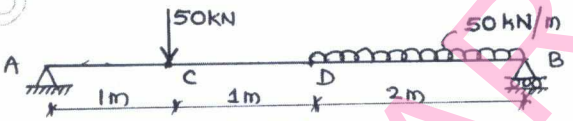

Fig.Q.4(a)

b. A cantilever beam AB of length 2m is carrying a point load 10kN at 'B'. The moment of inertia for the right half of the cantilever is $10^8 mm^4$ where as that for the left half is 2×10^8 mm^4. If $E = 2 \times 10^8$ kN/m^2, find the slope and deflection at the free end of the cantilever. Refer Fig.Q.4(b). Use Conjugate Beam Method. **(08 Marks)**

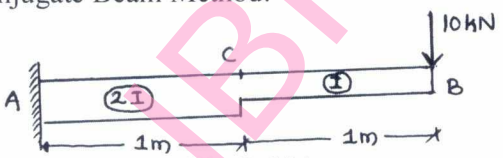

Fig.Q.4(b)

Module-3

5 a. Derive the expression for the strain energy stored in a beam due to flexure. **(06 Marks)**

b. Determine the vertical deflection at 'C' in the frame shown in Fig.Q.5(b). Take $E = 200 \times 10^6$ kN/m^2 and $I = 3 \times 10^7$ mm^4. Use Strain – Energy method. **(10 Marks)**

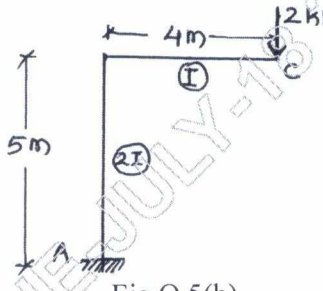

Fig.Q.5(b)

OR

6 a. Find the central deflection of a simply supported beam carrying a point load at mid span shown in Fig.Q.6(a) by using Unit Load method. **(06 Marks)**

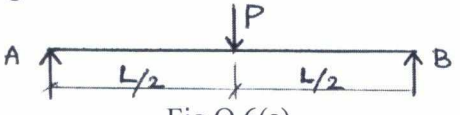

Fig.Q.6(a)

b. The cross-sectional area of the members is as indicated in Fig.Q.6(b). Using Strain – Energy method, find the strain energy stored due to loading. Take E = 200 kN/m^2. **(10 Marks)**

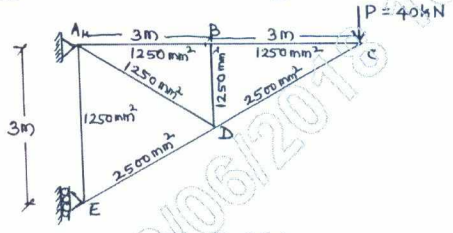

Fig.Q.6(b)

Module-4

7 a. A three hinged parabolic arch hinged at the springing and crown points has a span of 40m and central rise of 8m. It carries a UDL of 20kN/m over the left half of the span together with a concentrated load of 100kN at the right quarter span point. (Centre of right span). Find the reactions at the supports, normal thrust and radial shear at a section 10m from left support. **(08 Marks)**

b. A cable of span 20m and dip 4m carries a UDL of 20kN/m over the whole span. Find: i) Maximum tension in the cable; ii) Minimum tension in the cable; iii) The length of the cable. **(08 Marks)**

OR

8 a. A three hinged parabolic arch of span 20m and central rise of 5m carries a point load of 200kN at 6m from left hand support as shown in Fig.Q.8(a).

i) Find the reaction at the supports A and B.

ii) Draw the bending moment diagram for the arch and indicate the position of maximum bending moment. **(10 Marks)**

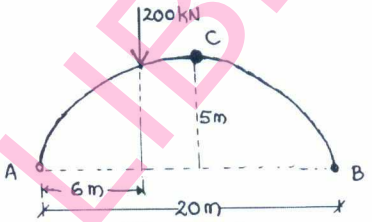

Fig.Q.8(a)

b A cable, supported on piers 80m apart at the same level, has a central dip of 8m. Calculate the maximum tension in the cable, when it is subjected to UDL of 30kN/m throughout the length. Also determine the vertical force on the piers, if the back stay is inclined at 60° to the vertical and cable passes over a pulley. **(06 Marks)**

Module-5

9 a. Define a Influence line diagram. What are the uses of ILD? **(06 Marks)**

b. Determine the reaction R_A by using ILD (influence line diagram) for beam loaded as shown in Fig.Q.9(b). **(10 Marks)**

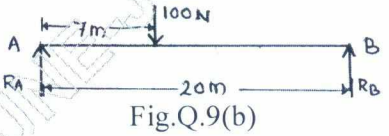

Fig.Q.9(b)

OR

10 a. Draw the influence line diagram for shear force at a section for a simply supported beam subjected to single point load. **(06 Marks)**

b. Draw the ILD for shear force and bending moment for a section 5m from left end of a simply supported beam 20m long. Hence calculate the maximum SF and maximum BM at the section due to an UDL of length 8m and intensity 10kN/m. **(10 Marks)**

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CBCS SCHEME

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15CV42

Fourth Semester B.E. Degree Examination, June/July 2018
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Assume any missing data suitably.

Module-1

1 a. Distinguish between Statically Determinate Beams and Indeterminate Beams with examples. **(05 Marks)**

b. Define Degree of freedom. What is the degree of freedom for a (i) Fixed support (ii) Hinged support. **(03 Marks)**

c. Determine static and kinematic indeterminacy for the following shown in Fig.Q1(c).

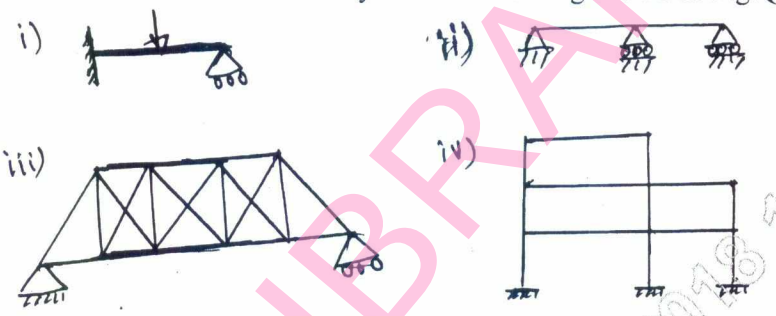

Fig.Q1(c) **(08 Marks)**

OR

2 a. Find the forces in all members of the pin-jointed truss shown in Fig.Q2(a) by method of joints. **(08 Marks)**

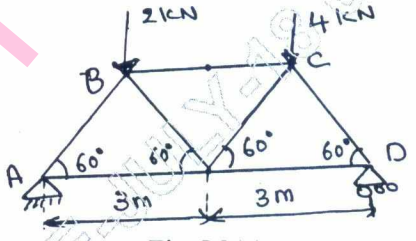

Fig.Q2(a)

b. Determine the nature and magnitude of forces in members FE, FD, CD by method of sections for the truss shown in Fig.Q2(b). **(08 Marks)**

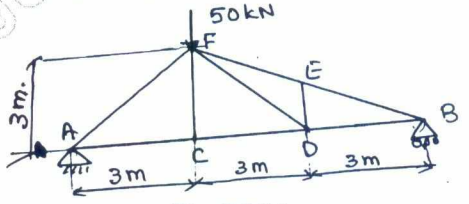

Fig.Q2(b)

Module-2

3 a. Derive Moment Curvature equation. **(06 Marks)**

b. A beam of length 6m is simply supported at its ends and carries a point load of 40 kN at a distance of 4m from the left support. Find the slopes at the supported ends and deflection under the load by Maculay's method. **(10 Marks)**

OR

4 a. Find the slope and deflection at the free end of the cantilever beam shown Fig.Q4(a) by moment area method. **(08 Marks)**

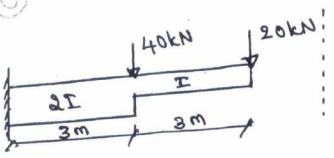

Fig.Q4(a)

b. Find the deflection under the concentrated load for the beam shown in Fig.Q4(b) using conjugate beam method. EI = 40000 kN-m^2. **(08 Marks)**

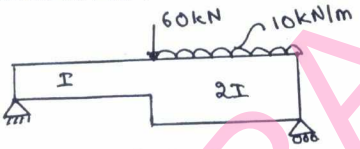

Fig.Q4(b)

Module-3

5 a. State (i) Castigliano's theorems (ii) Principal of virtual work. **(08 Marks)**

b. Determine the vertical deflection of joint C of the truss shown in Fig.Q5(b). Take E = 200×10^6 kN/m^2 and cross sectional area of each bar as 150×10^{-6} m^2. **(08 Marks)**

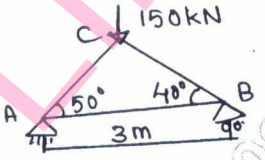

Fig.Q5(b)

OR

6 a. Determine the deflection of the cantilever beam shown in Fig.Q6(a) at its free end, by Castigliano's method. Take EI = 12000 Nm^2. **(06 Marks)**

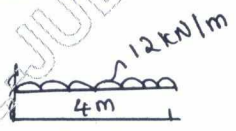

Fig.Q6(a)

b. Determine the vertical and horizontal deflection at end C of the bent frame shown in Fig.Q6(b) by unit load method. Take E = 200 GPa and I = $6(10)^7$ mm^4. **(10 Marks)**

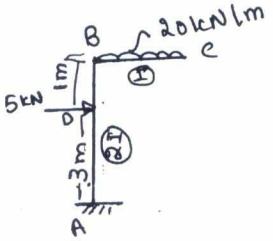

Fig.Q6(b)

Module-4

7 A three hinged parabolic arch has a span of 24m and a central rise of 4m. It carries a concentrated load of 75 kN at 18m from the left support and uniformly distributed load of 45 kN/m over the left half of the portion. Find out the resultant reactions. Also determine the bending moment, normal thrust and radial shear at a section 6m from the left support. **(16 Marks)**

OR

8 A suspension cable of snap 100m and dip 10m carries a uniformly distributed load of 10 kN/m over the full span. Find

(i) Maximum and minimum Tension in the cable and its inclination.
(ii) Minimum required cross sectional area of the cable if the allowable stress is 280 MPa.
(iii) Length of the cable
(iv) Vertical and horizontal forces transmitted to the supporting pylons (a) if the cable passed over a smooth pulley (b) if the cable is clamped to a saddle with roller on the top of the pier.

The anchor cable makes 30° to the horizontal at the pylons. **(16 Marks)**

Module-5

9 A simple girder of 20m span is traverssed by a moving uniformly distributed load of 6m length with an intensity of 20 kN/m from left to right. Find the maximum bending moment and maximum positive and negative shear forces at sections 4m from left support. Also find the absolute maximum bending moment that may occur anywhere in the girder. **(16 Marks)**

OR

10 Using relevant influence line diagram find (i) Maximum bending moment (ii) The maximum positive and negative shear forces at 4m from left support of a simply supported girder of span 10m, when a train of 4 wheel loads of 10 kN, 15 kN, 30 kN and 30 kN spaced at 2m, 3m and 3m respectively cross the span left to right with 10 kN load leading. [Refer Fig.Q10] **(16 Marks)**

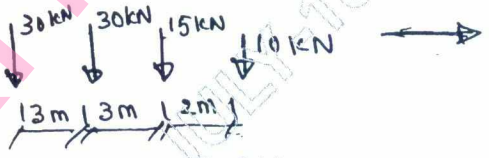

Fig.Q10

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CBCS Scheme

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15CV43

Fourth Semester B.E. Degree Examination, June/July 2018
Applied Hydraulics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. What is meant by Dimensional Homogeneity? Give example. **(06 Marks)**

b. The Frictional Torque (T) of a Disc of diameter (D) rotating at a speed (N) in a fluid of viscosity (μ) and density (ρ) in a turbulent flow using dimensional analysis prove $T = D^5N^2\rho\,\phi\left[\frac{\mu}{D^2N\rho}\right]$. **(10 Marks)**

OR

2 a. Explain three types of similarities in model analysis. **(06 Marks)**

b. A ship 300m long moves in a sea water, whose density is 1030 kg/m^3, A 1:100 model of this ship is to be tested in a wind tunnel. The velocity of air in the wind tunnel around the model is 30m/s and the resistance of the model is 60N. Determine the velocity of ship in sea water and also the resistance of the ship in sea water. The density of air is 1.24 kg/m^3. Take the kinematic viscosity of sea water and air as 0.012 stokes and 0.018 stokes respectively. **(10 Marks)**

Module-2

3 a. Explain classification of flow in open channel. **(06 Marks)**

b. Derive conditions for most economical rectangular channel. **(04 Marks)**

c. A trapezoidal channel has side slopes of 1H:2V and the slope of bed is 1 in 1500. The area of the section is 40m^2. Find the most economical dimensions of channel. Also determine the discharge of the channel. Take C = 50. **(06 Marks)**

OR

4 a. Explain with sketch the specific energy curve. **(06 Marks)**

b. The discharge of water through a rectangular channel of width 8m is 15 m^3/s, when depth of flow of water is 1.2m. Calculate:

i) Specific energy of flowing water.

ii) Critical depth and critical velocity.

iii) Value of minimum specific energy. **(10 Marks)**

Module-3

5 a. Derive equation of a hydraulic jump in a horizontal rectangular channel. **(10 Marks)**

b. A hydraulic jump forms at the downstream end of a spillway carrying 17.93 m^3/s discharge. If the depth before jump is 0.8m, determine the depth after jump and energy loss. **(06 Marks)**

OR

6 a. Explain following slope profiles: i) Critical slope ii) Mild slope iii) Steep slope also draw profiles of M1, M2 and M3. **(06 Marks)**

b. Derive expression for the length of backwater curve. **(10 Marks)**

Module-4

7 a. Derive expression for force and work done on a curved plate, which is moving in the direction of jet. **(06 Marks)**

b. A jet of water having a velocity of 40 m/s strikes a curved vane which is moving with a velocity of 20 m/s. The jet makes an angle of 30° with the direction of motion of vane at inlet and leaves at angle of 90° to the direction of motion of vane at outlet. Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vanes without shock. **(10 Marks)**

OR

8 a. Explain classification of Turbines. **(06 Marks)**

b. The Penstock supplies water from a reservoir to the pelton wheel with a gross head of 500m. One-third of gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of penstock is 2 m^3/s. The angle of deflection of the jet is 165°. Determine the power given by the water to the runner and also hydraulic efficiency take speed ratio as 0.45 and coefficient of velocity as 1. **(10 Marks)**

Module-5

9 a. Explain with a neat sketch the working of a inward flow reaction turbine (Francis turbine). **(06 Marks)**

b. A Kaplan turbine runner is to be designed to develop 9100 kW. The net available head is 5.6m. If the speed ratio is 2.09, flow ratio is 0.68, overall efficiency is 86% and the diameter of the boss is 1/3 × diameter of the runner. Find the diameter of the runner, its speed and specific speed of the turbine. **(10 Marks)**

OR

10 a. Explain components and working of a centrifugal pump. **(06 Marks)**

b. A centrifugal pump having outer diameter = 2 times the inner diameter and running at 1000 RPM works against a total head of 40m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 500mm and width at outlet is 50mm, determine: i) Vane angle at inlet ii) Work done by impeller on water/sec iii) Manometric efficiency. **(10 Marks)**

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CBCS SCHEME

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15CV/CT44

Fourth Semester B.E. Degree Examination, June/July 2018
Concrete Technology

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. IS-10262 mix design code is allowed.

Module-1

1 a. Why is concrete the most widely used engineering material? **(04 Marks)**
b. What is an admixture? Name different types of admixtures. **(04 Marks)**
c. Explain the manufacture of cement by dry process, with neat flow chart. **(08 Marks)**

OR

2 a. What are Bogue's compounds? Explain the influence of C_2S in strength gaining process. **(06 Marks)**
b. Name the different tests on cement. **(04 Marks)**
c. Explain briefly the action of accelerator and super plasticizers in the concrete mix, also name any two accelerators used in industry. **(06 Marks)**

Module-2

3 a. What is workability? Explain the factors affecting workability. **(08 Marks)**
b. Explain good and bad practices of making of fresh concrete. **(08 Marks)**

OR

4 a. What is segregation? How to prevent segregation in the concrete mix? **(08 Marks)**
b. Name the tests conducted on workability of concrete. **(04 Marks)**
c. What is curing? Name the methods of curing. **(04 Marks)**

Module-3

5 a. What is strength of concrete? What are the factors affecting the strength of concrete? **(08 Marks)**
b. Define creep, what are the factors affecting the creep of concrete. **(08 Marks)**

OR

6 a. How do you define durability? What are the factors improves the durability of concrete and explain briefly? **(08 Marks)**
b. What is sulphate attack? How to minimize sulphate attack? Also mention its action with equations. **(08 Marks)**

Module-4

7 a. Explain the main factors on which the IS-10262 mix design depends. **(08 Marks)**
b. Draw flow chart of IS code mix design. **(08 Marks)**

OR

8 It is required to design a M_{35} grade concrete mix having a slump of the order of 150-175mm for pile foundations of a structure. Use IS:10262-Indian standard recommended guidelines to estimate preliminary mix proportions. Consider very severe exposure condition during the service life of the structure.

Data:

I) Size of aggregate = 10mm to 20m
II) Specific gravity of aggregate = 2.67
III) Moisture content = 1 percent
IV) Absorption = 0.5 percent
V) Fine aggregate fineness modulus = 2.80 (grading zone I)
VI) Specific gravity = 2.62
VII) Moisture content = 4.1
VIII) Absorption = 1%
IX) Cement OYC grade 53
X) Specific gravity of cement = 3.15.

Other conditions

i) Standard deviation = 2MPa
ii) Air content = 4 to 5%
iii) Maximum allowable w/c ratio = 0.45
iv) Minimum cement content = 340 kg/m^3
v) Density of water = 1000 kg/m^3
vi) Bulk density of

Cement = 1450 kg/m^3
Fire aggregate = 1700 kg/m^3
Coarse aggregate = 1800 kg/m^3. **(16 Marks)**

Module-5

9 a. What is RMC? What are the factors on which the property of RMC depends? **(08 Marks)**

b. What is light weight concrete? Name the aggregates used as light weight aggregate? Explain its property. **(08 Marks)**

OR

10 a. What is self compacting concrete? How it is different from high performance concrete? **(04 Marks)**

b. What are the different types of fibers used in fiber reinforced concrete? **(04 Marks)**

c. Explain maximum and minimum values of workability values measured in L-box. V-tunel and flow test. Explain the above tests briefly. **(08 Marks)**

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CBCS SCHEME

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15CV45

Fourth Semester B.E. Degree Examination, June/July 2018
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions, choosing one full question from each module.***
2. ***Missing data, if any, may be suitably assumed and clearly stated.***

Module-1

1 a. With the help of phase diagrams, explain : i) Dry soil ii) Partially saturated soil iii) Saturated soil. **(06 Marks)**

b. 500g of dry soil was subjected to a sieve analysis. The weight of soil retained on each sieve is as follows :

I.S. Sieve size	Wt. of soil, g	I.S. Sieve size	Wt. of soil. g
4.75mm	10	212 μ	40
2.00mm	165	150 μ	30
1.00mm	100	75 μ	50
425 μ	85		

Plot the grain size distribution curve and determine the following :
i) Percentage of gravel , coarse sand , medium sand , fine sand and silt – clay fraction as per IS : 1498 – 1970.
ii) Effective size iii) Uniformity coefficient iv) Coefficient of curvature
v) The gradation of the soil. **(10 Marks)**

OR

2 a. List the consistency limits and their indices. **(04 Marks)**

b. Explain the Indian standard soil classification system and mention the use of plasticity chart. **(06 Marks)**

c. The weight of soil coated with the thin layer of paraffin wax was 6.90 N. The soil alone weighs 6.83 N. When the sample is immersed in water it displaces 360 mℓ of water. The specific gravity of soil is 2.73 and that of wax is 0.89. Find the void ratio and degree of saturation, if the moisture content is 17%. **(06 Marks)**

Module-2

3 a. List and explain various soil structures. **(08 Marks)**

b. The following results refers to compaction test as per IS light compaction :

Water content (%)	8.5	12.2	13.75	15.5	18.2	20.2
Wt. of wet soil (kg)	1.8	1.94	2.00	2.05	2.03	1.98

If the specific gravity of soil is 2.7 and volume of compaction mould is 1000 CC. Plot the compaction curve and obtain the maximum dry unit weight and optimum moisture content. **(08 Marks)**

OR

4 a. With the help of neat sketches, explain any two clay minerals. **(08 Marks)**

b. During compaction test on soil having specific gravity of 2.7 gave a maximum dry unit weight of 18kN/m^3 and the water content of 15%. Determine the degree of saturation , air content and percentage air voids at the maximum dry unit weight. What would be the theoretical maximum dry unit weight corresponding to zero air void at the optimum water content? **(08 Marks)**

Module-3

5 a. Explain : i) Superficial velocity ii) Seepage velocity iii) Capillary rise of water in soil. **(06 Marks)**

b. A soil stratum with permeability $K = 5 \times 10^{-7}$ cm/s overlies an impervious stratum. The impervious stratum lies at a depth of 18m below the ground surface. A sheet pile wall penetrates 8m into the permeable soil stratum. Water stands to a height of 9m on upstream side and 1.5m on downstream side above the surface of soil stratum. Sketch the flow net and determine i) Quantity of seepage ii) Seepage pressure at 'P' located 8m below the surface of soil stratum and 4m away from the sheet pile wall on its upstream side. **(10 Marks)**

OR

6 a. What is a Flownet? What are its characteristics and uses? **(06 Marks)**

b. A clay strata 6m thick laying below sand layer 5m thick. The water table is located at a depth of 2m from surface. The sand has porosity of 38% and specific gravity of 2.7. The sand above the water table may be taken as dry. The water content of clay layer if 60% and G = 2.65. Calculate total stress, pore water pressure and effective stress at the middle of clay layer and draw the distribution diagram. **(10 Marks)**

Module-4

7 a. Explain Mass – Spring analogy theory of consolidation of soil. **(06 Marks)**

b. A saturated soil stratum 5m thick lies above an impervious stratum and below a pervious stratum. It has a compression index of 0.25 and coefficient of permeability 3.2×10^{-4} cm/s void ratio at stress 150kN/m^2 is 1.9. Compute i) Change in void ratio due to increase of stress to 200kN/m^2 ii) Settlement due to increased load iii) Time required for 50% consolidation. **(10 Marks)**

OR

8 a. With the help of neat sketch, explain determination of pre-consolidation pressure by Casagrende's method. **(06 Marks)**

b. Differentiate between Normally consolidated and Over consolidated soils. **(04 Marks)**

c. A 3m thick layer of saturated clay in the field under a surcharge loading with achieve 90% consolidation in 75 days in double drainage conditions. Find the co-efficient of consolidation of the clay. **(06 Marks)**

Module-5

9 a. Explain Mohr – Coulomb failure theory of soil. **(06 Marks)**

b. Compute the shear strength of soil along a horizontal plane at a depth of 5m in a deposite of sand having the following particulars : Angle of internal friction , $\phi = 36^0$;
Dry unit weight , $\gamma_d = 17$ kN/m^3 ; Specific gravity , G = 2.7.
Assume the ground water table is at a depth of 2.4m below the ground level. Also determine change in shear strength if water level raises to ground level. **(10 Marks)**

OR

10 a. Explain the types of shear test based on different drainage conditions. **(06 Marks)**

b. In a drained triaxial compression test, a saturated sandy sample failed at a deviator stress of 360kN/m^2 and cell pressure of 100kN/m^2. Find the effective shear parameters of sand. If another identical sample is tested under a cell pressure of 200kN/m^2 , determine graphically the deviator stress at which the specimen fails. Check the results analytically. **(10 Marks)**

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CBCS SCHEME

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15CV46

Fourth Semester B.E. Degree Examination, June/July 2018
Advanced Surveying

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define degree of a curve. Establish the relationship between degree of a curve and its radius. **(04 Marks)**

b. Two tangents intersect each other at a chainage of 59 + 60, the deflection angle being 50°30′. It is required to connect the two tangents by a simple curve of 15 chain radius. Taking peg interval of 100 links, calculate the necessary data for setting out the curves by Rankine's method of deflection angles. Take length of the chain as 20m = 100 links. Also write a brief procedure for setting out the curve. **(12 Marks)**

OR

2 a. Distinguish between a compound curve and a reverse curve with sketches. **(06 Marks)**

b. A compound curve consists of two simple circular of radii 350m and 500m, respectively and is to be laid out between two tangents T_1I and IT_2. PQ is the common tangent and D is the point of compound curvature. The angles $\angle IPQ$ and $\angle IQP$ are 55° and 25° respectively. Given the chainage of point of intersection as 1800.00m, calculate the chainages of T_1, T_2 and D. **(10 Marks)**

Module-2

3 a. What are the important factors to be considered in selection of site for a base line? **(06 Marks)**

b. From a triangulation satellite station 'Q' 5.80m away from the main station A, the following directions were observed :
A : 0° 0′ 0″, B : 132° 18′ 30″, C: 232° 24′ 6″, and D : 296° 6′ 11″.
The inter connected base lines AB, AC and AD were measured as 3265.50m, 4022.20m and 3086.40m respectively. Determine the directions of AB, AC and AD. **(10 Marks)**

OR

4 a. Define the terms :
i) True error
ii) Residual error
iii) Conditioned equation
iv) Indirect observation. **(04 Marks)**

b. Three observed angles α, β and γ from a station P with probable errors of measurement are given below :
α = 78° 12′ 12″ ± 2″,
β = 136° 48′ 30″ ± 4″,
γ = 144° 59′ 8″ ± 5″
Determine their corrected values. **(12 Marks)**

Module-3

5 a. Define the terms :
   i) Celestial sphere
   ii) Hour angle
   iii) Prime vertical
   iv) Latitude of a place. **(04 Marks)**

b. Find the shortest distance between two places A and B given that their latitudes are 12°N and 13° 04'N with respective longitudes 72° 30' E and 80° 12' E. **(12 Marks)**

OR

6 a. Briefly explain the solution of spherical triangle by Napiers rule of circular parts. **(06 Marks)**

b. The standard time meridian in India is 80° 30' E. If the standard time of place is $20^H\ 24^M\ 06^S$, find the local mean time of two places having the longitudes as 20° E and 20° W respectively. **(10 Marks)**

Module-4

7 a. With a neat sketch, derive the expression for the scale of a vertical photograph. **(08 Marks)**

b. A line AB 2.00 kilometer long, lying at an elevation of 500m measures 8.65cm on a vertical photograph of focal length 20cm. Determine the scale of the photograph at an average elevation of 800m. **(08 Marks)**

OR

8 a. Define the terms :
   i) Tilt
   ii) Exposure station
   iii) Principal point
   iv) ISO centre. **(08 Marks)**

b. Mention the reasons for photograph over lap. Justify the same. **(08 Marks)**

Module-5

9 a. Define EDM. **(03 Marks)**

b. Explain the working of remote sensing equipment. **(05 Marks)**

c. What are the advantages of LIDAR technology? **(08 Marks)**

OR

10 a. Explain the working of total station. **(08 Marks)**

b. Explain the civil engineering applications in GIS and remote sensing. **(08 Marks)**

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CBCS Scheme

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15MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2018
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Find the rank of the matrix $\begin{bmatrix} 5 & 3 & 14 & 4 \\ 0 & 1 & 2 & 1 \\ 1 & -1 & 2 & 0 \end{bmatrix}$ by reducing to echelon form. **(06 Marks)**

b. Use Cayley-Hamilton theorem to find the inverse of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$. **(05 Marks)**

c. Apply Gauss elimination method to solve the equations $x+4y-z=-5$; $x+y-6z=-12$; $3x-y-z=4$ **(05 Marks)**

OR

2 a. Find all the eigen values and eigen vector corresponding to the largest eigen value of $\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$. **(06 Marks)**

b. Find the rank of the matrix by elementary row transformations $\begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix}$. **(05 Marks)**

c. Solve the system of linear equations $x+y+z=6$; $2x-3y+4z=8$; $x-y+2z=5$ by Gauss elimination method. **(05 Marks)**

Module-2

3 a. Solve $\frac{d^2y}{dx^2}+4y=\tan 2x$ by the method of variation of parameters. **(06 Marks)**

b. Solve $\frac{d^2x}{dt^2}+5\frac{dx}{dt}+6x=0$, given $x(0)=0$, $\frac{dx}{dt}(0)=15$. **(05 Marks)**

c. Solve $(D^2+5D+6)y=e^x$. **(05 Marks)**

OR

4 a. Solve by the method of undetermined coefficients $(D^2-2D+5)y=25x^2+12$. **(06 Marks)**

b. Solve $(D^2+3D+2)y=\sin 2x$. **(05 Marks)**

c. Solve $(D^2-2D-1)y=e^x\cos x$. **(05 Marks)**

Module-3

5 a. Find the Laplace transforms of, (i) $t\cos^2 t$ (ii) $\frac{1-e^{-t}}{t}$ **(06 Marks)**

b. Find the Laplace transforms of, (i) $e^{-2t}(2\cos 5t-\sin 5t)$ (ii) $3\sqrt{t}+\frac{4}{\sqrt{t}}$. **(05 Marks)**

c. Express the function, $f(t)=\begin{cases} t, & 0<t<4 \\ 5, & t>4 \end{cases}$ in terms of unit step function and hence find its Laplace transform. **(05 Marks)**

OR

6 a. Find the Laplace transform of the periodic function defined by $f(t) = E\sin\omega t$, $0 < t < \frac{\pi}{\omega}$ having period $\frac{\pi}{\omega}$. **(06 Marks)**

b. Find the Laplace transform of $2^t + t\sin t$. **(05 Marks)**

c. Find the Laplace transform of $\frac{2\sin t \sin 5t}{t}$. **(05 Marks)**

Module-4

7 a. Using laplace transforms method, solve $y'' - 6y' + 9 = t^2e^{3t}$, $y(0) = 2$, $y'(0) = 6$. **(06 Marks)**

b. Find the inverse Laplace transforms of, (i) $\frac{s^2 - 3s + 4}{s^3}$ (ii) $\frac{s+3}{s^2 - 4s + 13}$ **(05 Marks)**

c. Find the inverse Laplace transforms of, (i) $\log\left(\frac{s+1}{s-1}\right)$ (ii) $\frac{s^2}{(s-2)^3}$ **(05 Marks)**

OR

8 a. Solve the simultaneous equations $\frac{dx}{dt} + 5x - 2y = t$, $\frac{dy}{dt} + 2x + y = 0$ being given $x = y = 0$ when $t = 0$. **(06 Marks)**

b. Find the inverse Laplace transforms of $\cot^{-1}\left(\frac{s}{2}\right)$. **(05 Marks)**

c. Find the inverse Laplace transforms of $\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}$. **(05 Marks)**

Module-5

9 a. For any three arbitrary events A, B, C prove that ,
$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$ **(04 Marks)**

b. A class has 10 boys and 5 girls. Three students are selected at random, one after the other. Find probability that, (i) first two are boys and third is girl (ii) first and third boys and second is girl. (iii) first and third of same sex and the second is of opposite sex. **(06 Marks)**

c. In a certain college 25% of boys and 10% of girls are studying mathematics. The girls constitute 60% of the student body. (i) what is the probability that mathematics is being studied ? (ii) If a student is selected at random and is found to be studying mathematics, find the probability that the student is a girl? (iii) a boy? **(06 Marks)**

OR

10 a. State and prove Bayes theorem. **(04 Marks)**

b. A problem in mathematics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved? **(06 Marks)**

c. A pair of dice is tossed twice. Find the probability of scoring 7 points. (i) Once, (ii) at least once (iii) twice. **(06 Marks)**

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